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APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [X] Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)

2. [X] Specification *[Total Pages -31]*
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings *(if filed)*
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. [X] Drawing(s) *(35 USC 113)* *[Total sheets -13]*
4. [X] Oath or Declaration *[Total Pages - 3]*
a.1. [X] Newly executed (original or copy)
a.2. [] Unexecuted
b. [] Copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 17 completed)
[Note Box 5 below]
i. [] DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

5. [] Incorporation By Reference
(usable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

6. Microfiche Computer Program *(Appendix)*

7. []Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
a. [] Computer Readable Copy
b. [] Paper Copy (identical to computer copy)
c. [] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. [X] Assignment Papers (cover sheet & document(s))
9. [] 37 CFR 3.73(b) Statement [] Power of Attorney
(when there is an assignee)
10. [] English Translation Document *(if applicable)*
11. [] Information Disclosure Statement (IDS)/PTO-1449
[] Copies of IDS Citations
12. [] Preliminary Amendment
13. [X] Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
14. [] Small Entity Statement(s)
[] Statement filed in prior application, Status still proper and desired
15. [X] Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. [] Other

17. If a CONTINUING APPLICATION, *check appropriate box and supply the requisite information:*
[] Continuation [] Divisional [] Continuation-in-part (CIP) of prior Application No.

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APPARATUS FOR SUPPORTING INJECTION MIXING WORK

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for supporting injection mixing work, particularly to an apparatus for supporting work for mixing a plurality of injections in medical agency such as hospital and clinic.

It is often conducted in a medical work to mix a plurality of injections to dose it to a patient. Almost all of the injection mixing works are conducted by nurse in a nurse station in a hospital.

In the injection mixing works, it is necessary to select proper injection and conduct the work in proper order so as not to cause an appearance alteration such as turbidity, sedimentation and so on, and a composition alteration such as separation of component, decrease of content and titer and so on.

Thus, the nurse needs to have information about proper mixing of the injection. Such information is described in the literature but the amount thereof is huge. In addition, the information disperse and are difficult to understand.

There has been proposed an approach to make a list so that the nurse can easily understand combination of injections for proper mixing. In this case, it is

troublesome to find out a combination of injections among a number of combinations of injections. Therefore, in actual, the nurse inquires of a pharmacist about propriety of a combination of injections, resulting in taking a long time and delaying work.

Furthermore, there are many matters in mixing injections, for example, mixing (combination) order, composition alteration, side effect, dosing method, stability after dissolution and so on, but everybody is not always familiar with such matters. Therefore, it is difficult to mix the injections efficiently and certainly. If the injections are mixed in error, such mixture should be discarded.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an apparatus for supporting injection mixing work through which everybody can mix the injections efficiently and certainly.

According to the present invention, there is provided an apparatus for supporting injection mixing work, comprising:

a memory for storing data for supporting injection mixing work, the memory having a patient predicability data file for storing patient predicability

data including at least patient predicable information, an injection prescription data file for storing injection prescription data corresponding to the patient predicability data, and a combination related data file for storing combination related data corresponding to each injection of the injection prescription data;

a display for displaying the data stored in the memory; and

a controller for controlling the display to display the patient predicability data stored in the patient predicability data file correspondingly to both the injection prescription data corresponding to the patient predicability data and the combination related data of each injection included in the injection prescription data.

According to the present invention, because several kind of data with respect to combination of injections are displayed on the display, necessary information can be surely shortly obtained, enhancing the efficiency of mixing work of injections.

Preferably, the combination related data file of the memory stores pH-values data for each injection, and wherein the controller decides a mixing order of the injections contained in injection prescription data in accordance with the pH-values data and displays it on the display. Thus, the mixing order of the injections can be

automatically decided, further enhancing the efficiency of mixing work of injections.

Preferably, the combination related data file of the memory stores differentiation data for differentiating transfusion and solely administrated medicament, and wherein the controller classifies the injection contained in the injection prescription data for a patient into transfusion or solely administrated medicament in accordance with the differentiation data and displays it on the display. Thus, the medicament which can not be mixed can be differentiated, further enhancing the efficiency of mixing work of injections.

Preferably, the combination related data file of the memory stores incompatibility data showing whether or not a combination of two kinds of injections is incompatible, and wherein the controller decides whether or not a combination of two kinds of injections contained in the injection prescription data for a patient is incompatible in accordance with the incompatibility data and displays it on the display. Thus, necessary information with respect to the incompatibility can be surely shortly obtained, preventing generation of injection which will not be able to use as a result of mixing.

Preferably, the combination related data file of the memory stores attention information data related to

each injection, and wherein the controller displays an attention information in the attention information data on the display correspondingly to each injection of the injection prescription data. Thus, when mixing the injections, detailed attention information can be confirmed in accordance with the displayed contents on the display, enabling to more properly conduct the mixing work.

Preferably, the apparatus further comprises a reader for reading an identification code for identifying each injection, wherein the controller displays progress situation of mixing work on the display in accordance with the identification code read by the reader when conducting the mixing work of the injection. Thus, mixing work can be effectively conducted with the displayed contents on the display confirming, enabling to more effectively conduct the mixing work.

Preferably, when conducting the mixing work of the injection in the mixing order decided in accordance with the pH-values data, the controller decides whether the injection is proper or not in accordance with the identification code of the injection read by the reader, and if improper, displays it on the display. Thus, it is possible to properly conduct the mixing work without failing, surely preventing error of mixing procedure.

Preferably, the apparatus further comprises an

input device which is used to input new incompatibility data in addition to the incompatibility data stored in the combination related data and store it in the combination related data of the memory. Thus, it is possible to effectively use the information of new incompatibility data at the next mixing work, preventing waste of injection.

Preferably, the apparatus further comprises a reader for reading a prescription identification code for identifying each injection prescription data, wherein the controller reads the corresponding injection prescription data in accordance with the prescription identification code and displays it on the display. Thus, it is possible to prevent delay of input operation, further enhancing the efficiency of mixing work of injections.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the present invention will become clear from the following description taken in conjunction with the preferred embodiments thereof with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram of an apparatus for supporting injection mixing work according to the present invention;

Fig. 2 is a diagram showing a injection prescription file of the apparatus of Fig. 1;

Fig. 3 is a front view of a injection prescription data input screen displayed on a liquid crystal display of the apparatus of Fig. 1;

Fig. 4 is a flow chart showing a support process of injection mixing executed by a central processing unit of the apparatus of Fig. 1;

Fig. 5 is a flow chart showing an input process of injection prescription data of Fig. 4;

Fig. 6 is a flow chart showing a decision process of mixing order of Fig. 4;

Fig. 7 is a flow chart showing a decision process of incompatibility of Fig. 4;

Fig. 8 is a flow chart showing a management process of mixing-work progress situation of Fig. 4;

Fig. 9 is a flow chart continued from Fig. 8;

Fig. 10 is a front view of an injection mixing support screen displayed on the liquid crystal display of the apparatus of Fig. 1;

Fig. 11 is a front view of the injection prescription data input screen of Fig. 3 with two prescriptions inputted;

Fig. 12 is a front view of a screen showing composition alteration in incompatibility displayed on the liquid crystal display of Fig. 1;

Fig. 13 is a front view of a screen showing

content of attention information displayed on the liquid crystal display of Fig. 1; and

Fig. 14 is a front view of a screen showing record of composition alteration displayed on the liquid crystal display of Fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 shows a block diagram of an apparatus for supporting injection mixing work according to the present invention. The apparatus for supporting injection mixing work comprises a memory device 1, an input/output device 2 and a central processing unit 3.

The memory device 1 includes an injection prescription data file, a mixing work supporting data file, an incompatibility data file, an attention information data file, a composition alteration record file and several kinds of master files.

The injection prescription data file stores, as shown in Fig. 2, only code data of injection prescription data (Fig. 3) per one day on which injection is conducted. Concretely, the code data includes input date, patient number, date of practice, mixing result flag and prescription number.

The input date and date of practice are represented by numbers showing year of grace, month and day.

The patient number comprises a patient code represented by eight figures which is peculiar to each patient, and code numbers corresponding to ward, sickroom, clinic and doctor. The mixing result flag comprises code numbers 0, 1 and 2 allocated for "not mixing", "mixing OK" and "generation of composition alteration" respectively. The mixing result flag is used for discriminant when reading the injection prescription data as described hereinafter. The prescription number comprises code numbers allocated for each injection prescription data. Thus, data is read from the several kinds of master files in accordance with these code data.

Generally, the doctor conducts direction of injection prescriptions for several days together. In conformity with this, therefore, the injection prescriptions for several days are also stored together in the injection prescription file. In the case that the doctor conducts direction of injection prescription one after another due to change of condition of the patient, a plurality of different injection prescription data would present for the same patient and for the same injection day.

The injection prescription data can be inputted by a keyboard 8 or a mouse 9, or otherwise can be automatically read from the host computer 12.

The mixing work supporting data file stores all

kind of necessary data to operate the apparatus for supporting injection mixing work. Such data is set for each medicament code as shown in Table 1.

Table 1

Medicament Code	PH-value	Transfusion Flag	Mixing Attention Flag	Stability Time (H) after Dissolution
---	---	---	---	---
INJE (Injection E)	6.2	0	0	
INJA (Injection A)	4.0	0	1 (Mixing Attention)	
INJC (Injection C)	8.0	0	0	
INJD (Injection D)	3.6	0	2 (sole Administration)	2
INJB (Injection B)	5.5	1 (Transfusion)	0	
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In Table 1, the medicament code is expressed by abbreviation so that the pharmacist can easily input it and the quantity of data can be reduced. For example, the medicament code of injection E is expressed by INJE. The medicament code is the same as one stored in a medicament master file which will be described hereinafter.

The pH-value is index number of hydrogen ion within medicament. The injection is apt to cause composition alteration based on pH-value.

The transfusion flag serves to show whether the medicament is transfusion or not. If the medicament is

transfusion, then the transfusion flag is "0"; and if the medicament is not transfusion, then the transfusion flag is "1". In general, the injection of more than 100 ml is defined as transfusion. The transfusion is administrated after mixing with another small quantity of injection.

The mixing attention flag serves to show whether any attention is necessary or not when mixing injections. If no attention is necessary, then the mixing attention flag is "0"; if any attention is necessary because of causing composition alteration, then the mixing attention flag is "1"; and if there is need to solely administrate the medicament without mixing, then the mixing attention flag is "2".

The stability time after dissolution means a time for which after dissolving the powder injection, the dissolved injection holds its stability. The reason why the injection has a state of powder is that if the medicament has a state of liquid, it has bad stability. In Table 1, therefore, the column of stability time after dissolution for the liquid medicament is blank.

The incompatibility data file stores information about incompatibility between two kinds of injections as shown in Table 2.

Table 2

Code of Medicament A	Code of Medicament B	Incompatibility Flag	Content of Composition

			Alteration
---	---	---	---
INJA (Injection A)	INJC (Injection C)	0 (△)	After 6 hours, survival Titer 91%
INJA (Injection A)	INJF (Injection F)	1 (×)	Immediately, Whited Sedimentation
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In Table 2, the incompatible flag is used to show the content of incompatibility. If the content is conditional incompatibility (shown by symbol of "△"), then the incompatible flag is "0"; and if the content is full incompatibility (shown by symbol of " × "), then the incompatible flag is "1". The conditional incompatibility means a mixed injection that can be used within 6 hours after mixing but cannot be used over after 6 hours has passed.

The attention information data file stores attention matters when using injection as shown in Table 3.

Table 3

Medicament Code	Attention Information
---	---
INJE (Injection E)	Shading should be done during drip.
INJE (Injection E)	Watch the shock during administration.
INJD (Injection D)	Injection velocity is to be below 50mg per minutes.
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The composition alteration record file records generation situation of composition alteration as shown in Table 4.

Table 4

Terminal ID	Generation Date	Recorder	Content of Composition Alteration	Name of Generation Situation Data File
---	---	---	---	---
o.3	1998.12.18 08:06	6007 (Yoshiko Kawamura)	Turbidity	HK03001.TXT
0.5	1998.12.18 08:28	7012 (Kazuko Morimoto)	Sedimentation	HK05001.TXT
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The master files include a medicament master file, a patient master file, a manipulation master file, a usage master file, a ward master file, a clinic master file, a doctor master file, a nurse master file and so on. Each file stores code numbers corresponding to item names.

The input/output device 2 includes a liquid crystal display 4, a touch panel 5, a printer 6, an identification code reader (barcode reader) 7, a keyboard 8, a mouse 9 and so on.

The liquid crystal display 4 is used to display all kinds of data and so on. The liquid crystal display 4 may be replaced by a CRT display.

The touch panel 5 is provided in order to enhance the operation of input. The touch panel 5 is substituted by the liquid crystal display 4, the keyboard 8, the mouse 9 and so on.

The identification code reader 7 is used to read the identification code (barcode) of the injection prescription and the injection. The identification code is not limited to the barcode but may be two-dimensional code of small surface area.

The CPU 3 has an internal random-access memory (RAM) to store all kind of data and an internal read-only memory (ROM) to store control program. The CPU 3 executes a support process for injection mixing work in response to input signal from the input/output device 2, which will be described hereinafter.

The numeral 12 designates a host computer which transmits injection prescription data to the aforementioned apparatus for supporting injection mixing work from external.

Hereinafter, operation of the apparatus for supporting injection mixing work will be explained in accordance with the flowchart as shown in Fig. 4.

When an operator pushes a button of "injection prescription data input" on a menu screen (not shown) displayed on the liquid crystal display 4, an injection

prescription data input screen is displayed (step S1).

The injection prescription data input screen comprises, as shown in Fig. 3, columns of "patient attribute information", "date of practice", "mixing results" and "prescription", date of today, and operating buttons of "new input", "input OK", "cancel" and "end of mixing work". The column of "patient attribute information" includes patient number, patient name and so on. In the column of "date of practice", date of today is indicated. If the desired date is inputted, the injection prescription data corresponding to the desired date is read in and displayed on the column of "prescription". In the column of "mixing results", the content of the mixing result flag for each injection prescription data is indicated. Generally, the content of the mixing result flag is "0; not mixing". If desired, "1; mixing OK" or "2; generation of composition alteration" can be inputted to read in the specified kind of injection prescription data. In the column of "prescription", prescription number, medicament code, medicament name, manipulation (injection manipulation: intravenous injection, intravenous drip injection, hypodermic injection, intramuscular injection), usage, and one dose rate.

All columns of the injection prescription data input screen are blank in the initial state. Thus, input

process of injection prescription data from the injection prescription file is executed (step S2).

In the input process of injection prescription data, as shown in Fig. 5, the operator conducts input operation by using the identification code reader 7, the key board 8, the mouse 9 and so on (step S21). For example, identification codes of injection prescription sheets are read by using the identification code reader 7, and operation buttons (mouse button, touch panel) are operated. Then, it is judged whether or not the identification code is inputted (step S22). If the identification code is inputted, the injection prescription data corresponding to the identification code is read from the injection prescription file, whereby data of patient attribute information as well as the injection prescription data is indicated on the screen (step S23).

Since the injection prescription data has already been automatically read in from the host computer 12 and stored in the injection prescription file, the injection prescription data is read from the injection prescription file. In the injection prescription file, as described before, only medicament codes are stored. Therefore, the formal medicament name corresponding to the medicament code is read in from the medicament master file. For example, in the case of the medicament code "INJA", the formal

medicament name "injection A; 10 ml" is read in from the medicament master file.

The injection prescription sheet may be a list such as an injection work sheet. The identification code may be printed directly on the injection prescription sheet. Alternatively, a sheet on which the identification code is printed may be stuck on the injection prescription sheet. The contents of the identification code can be patient number, injection prescription number, ID number of injection prescription data or so.

On the contrary, if the identification code is not inputted, it is judged whether or not the button of "New Input" is operated (step S24). If the button of "New Input" is operated, the injection prescription data input screen is made blank. Thus, the operator can input the injection prescription data (step S25). When the patient number is inputted in the column of "patient attribute information", patient name, sexuality and birth are read in from the patient master file to display them on the column of "patient attribute information". Age of patient is calculated based on birth and date of today to display it. AS to ward, sickroom, clinic and doctor, when the operator inputs the code numbers for them, the corresponding data is read in from the respective master file to display them. For example, the operator inputs code "60" for the ward,

data of "6 floors ward" is read in to display it. In the same manner, when code numbers for each column are inputted, the corresponding data are read in from the respective master file to display them.

Subsequently, when the button of "cancel" is operated (step S26), each data displayed on the injection prescription data input screen is erased (step S27). When the button of "input OK" is operated in stead of the button of "cancel" (step S28), the input process of injection prescription data is terminated to return to the main process. When the button of "end of mixing work" is operated because of no injection prescription data (step S29), he input process of injection prescription data is terminated to return to the main process. Thus, the injection prescription data input screen is changed to the menu screen.

When the button of "input OK" on the screen of "injection prescription data input" as shown in Fig. 3 is operated to terminate the input process of injection prescription data as shown in Fig. 5, a screen of "injection mixing support" as shown in Fig. 10 is displayed (step S3). In this screen, the column of "patient attribute information" (patient number to doctor) is displayed first. The injection prescription data which has the mixing result flag of "not mixing" is read in from the

injection prescription file (step S4).

Thus, in accordance with the injection prescription data read in at the step S4, a decision process of injection mixing order is executed (step S5).

In the decision process of injection mixing order, as shown in Fig. 6, after acquiring pH values of medicaments from the mixing work supporting data file by using the medicament codes as a search key, the medicaments are rowed in order in accordance with the pH values thereof (step S31). The medicament of transfusion is moved to the forefront (step S32). If there are a plurality of medicaments of transfusion, the medicaments are moved to the forefront keeping the order of pH values as it is. Then, the medicament of sole administration is moved to the rear (step S33). In this embodiment, the medicament with the mixing attention flag of "sole administration" is moved to the rear. If there are a plurality of medicaments of sole administration, in the same manner as in the case of medicaments of transfusion, the medicaments are moved to the rear keeping the order of pH values as it is. Thus, the mixing order of the remaining medicaments which are not moved is decided (step S34).

After the mixing order of the medicaments within the injection prescription data is decided in the decision process of injection mixing order as described above, the

mixing order is indicated on the screen of "injection mixing support" as shown in Fig. 10 and printed by the printer 6 (step S6). In this stage, the columns of "incompatibility" and "number" are blank.

Subsequently, a decision process of incompatibility of injections is executed (step S7).

In the decision process of incompatibility of injections, as shown in Fig. 7, it is judged whether or not the medicaments with the mixing order decided as described above are incompatible in accordance with the incompatible combination stored in the incompatibility data file (step S41). If there is an incompatible combination (step S42), data corresponding to the incompatible combination is read in from the incompatibility data file (step S43).

The contents of the data corresponding to the incompatible combination are indicated on a screen showing content of composition alteration which is a different window from the screen of "injection mixing support" as shown in Fig. 10 (step S8). The content of composition alteration can be printed by pressing the button of "print". The content of incompatibility is indicated by the symbols of "△" or "×" in the column of " incompatibility " on the screen of "injection mixing support".

After the decision process of incompatibility of injections is terminated, the attention information is

obtained from the attention information data file (step S9). Then, the attention information is indicated on a attention information screen as shown in Fig. 13 (step S10). The order of the indication is same as in the decision process of mixing order (step S5). The indicated attention information can be printed by pressing the button of "print".

After completion of preparation for mixing the injections, a management process of mixing-work progress situation is executed (step S11).

In the management process of mixing-work progress situation, as shown in Figs. 8 and 9, the medicament to be mixed is indicated by marking "★" on the beginning of the line (step S51) and reversing the representation on the line. Thus, the operator can recognize at a glance the medicament to be mixed.

Then, the operator conducts input operation of injections which are used in the mixing work (step S52). In this input operation, the operator can read the identification code of the medicaments (injections) to be mixed by using the identification code reader 7 and operating the operation buttons (mouse button, touch panel). Then, it is judged whether or not the identification code is inputted (step S53). If the identification code is inputted, then it is judged whether or not the medicament

with the identification code inputted is in conformity with the medicament indicated at step S51 (step S54). If NO, a nonconformity error is indicated (step S55). If YES, the number indicated on the column of "number" is counted up and it is judged whether or not the number reaches the specified mixing number (step S56). If NO, the flow is returned to step S52 to repeat the same process until the number reaches the specified mixing number. For example, as the mixing number of the injection A as shown in Fig. 10 is two, the process is repeated twice. The operator (nurse) proceeds the mixing work of the medicaments at every time when she/he confirms the conformity.

If the number reaches the specified mixing number, it is judged whether or not the input process of the medicaments to be mixed is finished (step S57). If NO, the next medicament to be mixed is indicated (step S58). The sequential process is executed until the input and mixing process of all medicaments to be mixed is finished. If the input and mixing process of all medicaments to be mixed is finished, it is confirmed that a button of "record of composition alteration" is not operated, and then the mixing result flag of the injection prescription data in the injection prescription file is set to "mixing OK" (step S59).

On the other hand, if the identification code of

the medicament to be mixed is not inputted at step S53, the operation buttons on the injection mixing support screen of Fig. 10 are operated due to the operator's own discrimination.

Thus, it is judged whether or not the button of "go to next medicament" is operated (step S60). For example, in the case that the reading is out because the identification code is foul, the operator can operate the button of "go to next medicament" to proceed next medicament. If it is judged that the button is operated, then the flow is returned to step S57 and the same process is repeated.

In the case that it has been already confirmed that the mixing is proper (OK) because of same combination of injections, the operator can operate the button of "mixing OK". If it is judged that the button is operated (step S61), then the flow is returned to step S59 and the same process is repeated.

In the case that the mixing is not proper because the composition alteration is caused during mixing of the medicaments, the operator can operate the button of "record of composition alteration". If it is judged that the button is operated (step S62), a screen of record of composition alteration as shown in Fig. 14 is displayed. Then, the operator inputs the content (comment) of the

composition alteration (step S64) and operates the button of "record OK". Thus, the content of the composition alteration inputted by the operator is written in the composition alteration record file (step S65). subsequently, the mixing result flag of the injection prescription data in the injection prescription file is set to "generation of composition alteration" (step S66). At this stage, only the fact that the composition alteration is caused due to the combination of plural injections contained in the injection prescription data is recorded. Afterward, an experiment is conducted on the basis of the record. AS a result, if a combination of two kind of injections which causes the composition alteration can be specified, the combination is recorded in the incompatibility data file.

In the case that record of composition alteration is not desired, the operator can operate the buttons of "cancel" or "end of mixing work". If it is judged that the button is operated (step S63), the management process of mixing-work progress situation is compulsorily terminated. When the button of "end of mixing work" is operated, the injection mixing support screen is changed to the menu screen. By operating the button of "print", the content of the injection mixing support screen can be printed.

According to the management process of mixing-

work progress situation, it is possible to surely confirm whether or not the selected injection is in conformity with the indicated injection.

Finally, it is judged whether or not all of the injection prescription data for the present patient are treated (step S12). If NO, the flow is returned to step S4 and the same process is repeated with respected to the next injection prescription data. If YES, the flow is returned to step S1 and the same process is repeated with respected to the next patient.

In the case that a plurality of prescriptions is issued for one patient, the column of "prescription" of the injection prescription data input screen is shown in Fig. 11.

The CPU 3, the liquid crystal display 4, the keyboard 8, the mouse 9 and memory device 1 in the above described embodiment can be substituted by a personal computer. The memory device 1 may be an independent file server (with CPU built-in). The system may be a client/server architecture in which the CPU 3 as a client terminal is connected to the server via the network (LAN). For example, the server is disposed in medicine information office of medicament division of hospital; a plurality of client terminals are disposed in each nurse station of ward. According to this arrangement, all data which the apparatus

for supporting injection mixing work needs can be controlled by the nurse through the server.

Although the present invention has been fully described by way of the examples with reference to the accompanying drawings, it is to be noted here that various changes and modifications will be apparent to those skilled in the art. Therefore, unless such changes and modifications otherwise depart from the spirit and scope of the present invention, they should be construed as being included therein.

WHAT IS CLAIMED IS:

1. An apparatus for supporting injection mixing work, comprising:

a memory for storing data for supporting injection mixing work, the memory having a patient predicability data file for storing patient predicability data including at least patient predicable information, an injection prescription data file for storing injection prescription data corresponding to the patient predicability data, and a combination related data file for storing combination related data corresponding to each injection of the injection prescription data;

a display for displaying the data stored in the memory; and

a controller for controlling the display to display the patient predicability data stored in the patient predicability data file correspondingly to both the injection prescription data corresponding to the patient predicability data and the combination related data of each injection included in the injection prescription data.

2. The apparatus for supporting injection mixing work as in claim 1, wherein the combination related data file of the memory stores pH-values data for each injection, and wherein the controller decides a mixing order of the

injections contained in injection prescription data in accordance with the pH-values data and displays it on the display.

3. The apparatus for supporting injection mixing work as in claim 1, wherein the combination related data file of the memory stores differentiation data for differentiating transfusion and solely administrated medicament, and wherein the controller classifies the injection contained in the injection prescription data for a patient into transfusion or solely administrated medicament in accordance with the differentiation data and displays it on the display.

4. The apparatus for supporting injection mixing work as in claim 1, wherein the combination related data file of the memory stores incompatibility data showing whether or not a combination of two kinds of injections is incompatible, and wherein the controller decides whether or not a combination of two kinds of injections contained in the injection prescription data for a patient is incompatible in accordance with the incompatibility data and displays it on the display.

5. The apparatus for supporting injection mixing

work as in claim 1, wherein the combination related data file of the memory stores attention information data related to each injection, and wherein the controller displays an attention information in the attention information data on the display correspondingly to each injection of the injection prescription data.

6. The apparatus for supporting injection mixing work as in claim 1, further comprising a reader for reading an identification code for identifying each injection, wherein the controller displays progress situation of mixing work on the display in accordance with the identification code read by the reader when conducting the mixing work of the injection.

7. The apparatus for supporting injection mixing work as in claim 6, wherein , when conducting the mixing work of the injection in the mixing order decided in accordance with the pH-values data, the controller decides whether the injection is proper or not in accordance with the identification code of the injection read by the reader, and if improper, displays it on the display.

8. The apparatus for supporting injection mixing work as in claim 4, further comprising an input device

which is used to input new incompatibility data in addition to the incompatibility data stored in the combination related data and store it in the combination related data of the memory.

9. The apparatus for supporting injection mixing work as in claim 1, further comprising a reader for reading a prescription identification code for identifying each injection prescription data, wherein the controller reads the corresponding injection prescription data in accordance with the prescription identification code and displays it on the display.

ABSTRACT OF THE DISCLOSURE

An apparatus for supporting injection mixing work comprises a memory 1 for storing data for supporting injection mixing work, a display 4 for displaying the data stored in the memory and a controller 3 for controlling the display. The memory has a patient predicability data file for storing patient predicability data including at least patient predicable information, an injection prescription data file for storing injection prescription data corresponding to the patient predicability data, and a combination related data file for storing combination related data corresponding to each injection of the injection prescription data. The controller displays the patient predicability data stored in the patient predicability data file correspondingly to both the injection prescription data corresponding to the patient predicability data and the combination related data of each injection included in the injection prescription data.

Fig.1

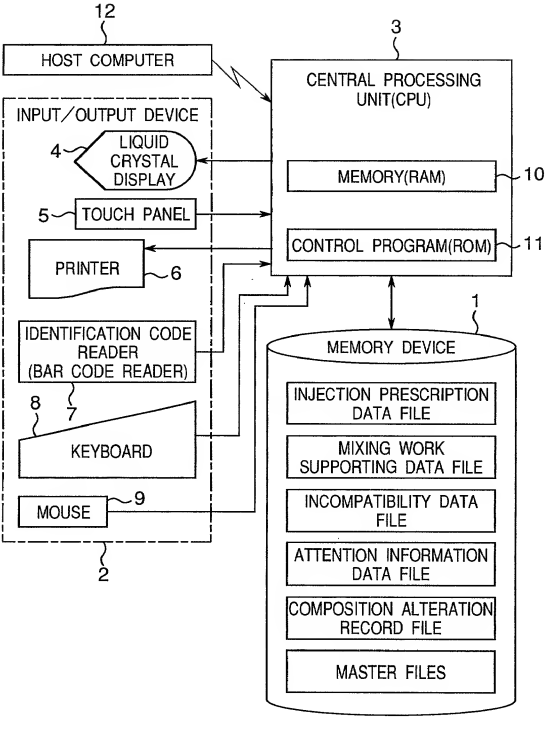

12
HOST COMPUTER
3
CENTRAL PROCESSING UNIT(CPU)
INPUT/OUTPUT DEVICE
4
LIQUID CRYSTAL DISPLAY
MEMORY(RAM)
10
5
TOUCH PANEL
CONTROL PROGRAM(ROM)
11
PRINTER
6
1
IDENTIFICATION CODE READER (BAR CODE READER)
MEMORY DEVICE
INJECTION PRESCRIPTION DATA FILE
8
7
KEYBOARD
MIXING WORK SUPPORTING DATA FILE
INCOMPATIBILITY DATA FILE
MOUSE
9
ATTENTION INFORMATION DATA FILE
COMPOSITION ALTERATION RECORD FILE
MASTER FILES
2

Fig.2

<INJECTION PRESCRIPTION FILE>

----	INJECTION PRESCRIPTION DATA #N	INJECTION PRESCRIPTION DATA # (N+1)	----
	(INPUT DATE) 19981218 (PATIENT No.) 93026581 60 601 01 0102 (DATE OF PRACTICE) 19981218 (MIXING RESULT FLAG) 0 (PRESCRIPTION No.) 1 INJA 2 A INJB 1 V INJC 1 A INJD 1 V INJE 0.5 A /02 *101	(INPUT DATE) 19981218 (PATIENT No.) 95001631 70 702 02 0203 (DATE OF PRACTICE) 19981218 (MIXING RESULT FLAG) 0 (PRESCRIPTION No.) 1 INJD 2 V INJE 1 A /02 *201	
---			---

Fig.3

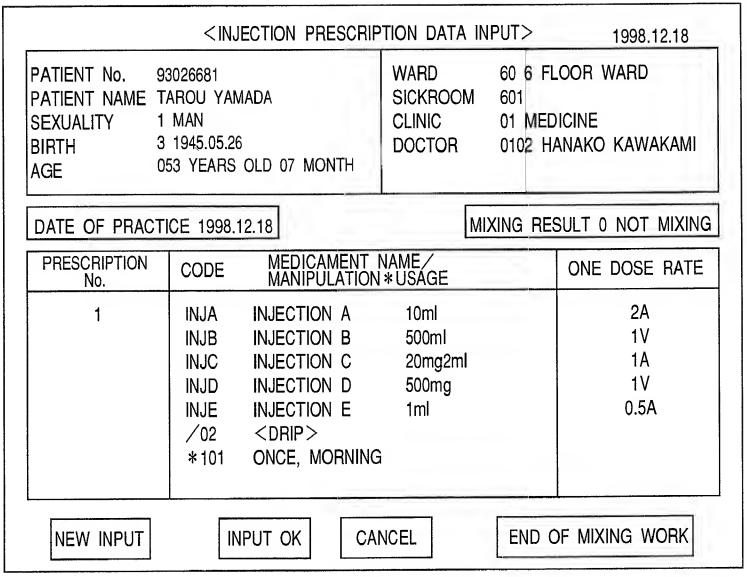

<INJECTION PRESCRIPTION DATA INPUT>
1998.12.18
PATIENT No. 93026681
PATIENT NAME TAROU YAMADA
SEXUALITY 1 MAN
BIRTH 3 1945.05.26
AGE 053 YEARS OLD 07 MONTH
WARD 60 6 FLOOR WARD
SICKROOM 601
CLINIC 01 MEDICINE
DOCTOR 0102 HANAKO KAWAKAMI
DATE OF PRACTICE 1998.12.18
MIXING RESULT 0 NOT MIXING
PRESCRIPTION No.
CODE
MEDICAMENT NAME/ MANIPULATION*USAGE
ONE DOSE RATE
1
INJA INJECTION A 10ml 2A
INJB INJECTION B 500ml 1V
INJC INJECTION C 20mg2ml 1A
INJD INJECTION D 500mg 1V
INJE INJECTION E 1ml 0.5A
/02 <DRIP>
*101 ONCE, MORNING
NEW INPUT
INPUT OK
CANCEL
END OF MIXING WORK

Fig.4

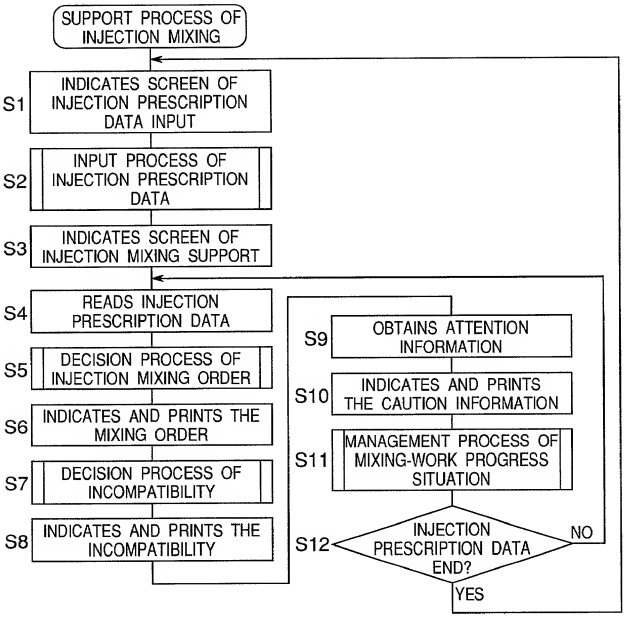

SUPPORT PROCESS OF INJECTION MIXING
S1
INDICATES SCREEN OF INJECTION PRESCRIPTION DATA INPUT
S2
INPUT PROCESS OF INJECTION PRESCRIPTION DATA
S3
INDICATES SCREEN OF INJECTION MIXING SUPPORT
S4
READS INJECTION PRESCRIPTION DATA
S5
DECISION PROCESS OF INJECTION MIXING ORDER
S6
INDICATES AND PRINTS THE MIXING ORDER
S7
DECISION PROCESS OF INCOMPATIBILITY
S8
INDICATES AND PRINTS THE INCOMPATIBILITY
S9
OBTAINS ATTENTION INFORMATION
S10
INDICATES AND PRINTS THE CAUTION INFORMATION
S11
MANAGEMENT PROCESS OF MIXING-WORK PROGRESS SITUATION
S12
INJECTION PRESCRIPTION DATA END?
NO
YES

Fig.5

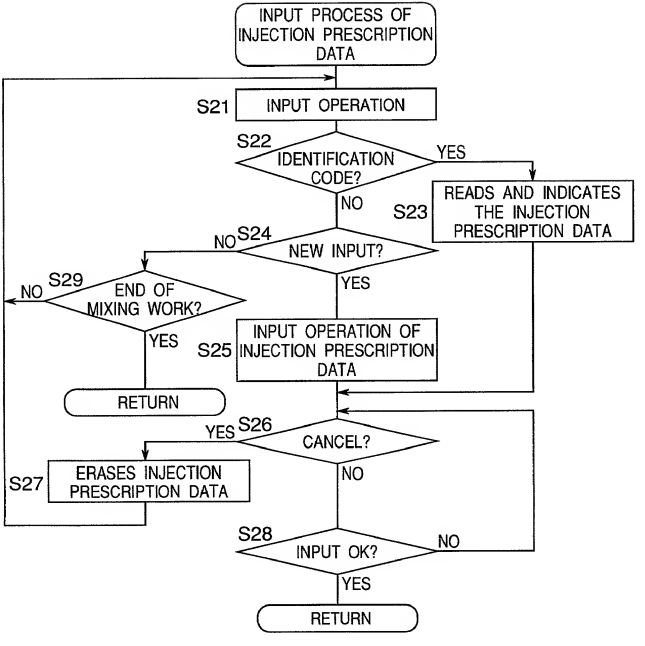

INPUT PROCESS OF INJECTION PRESCRIPTION DATA
S21
INPUT OPERATION
S22
IDENTIFICATION CODE?
YES
NO
S23
READS AND INDICATES THE INJECTION PRESCRIPTION DATA
NO
S24
NEW INPUT?
YES
NO
S29
END OF MIXING WORK?
YES
S25
INPUT OPERATION OF INJECTION PRESCRIPTION DATA
RETURN
YES
S26
CANCEL?
NO
S27
ERASES INJECTION PRESCRIPTION DATA
S28
INPUT OK?
NO
YES
RETURN

Fig.6

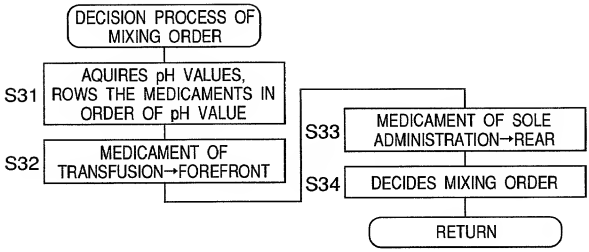

DECISION PROCESS OF MIXING ORDER
S31
AQUIRES pH VALUES, ROWS THE MEDICAMENTS IN ORDER OF pH VALUE
S32
MEDICAMENT OF TRANSFUSION→FOREFRONT
S33
MEDICAMENT OF SOLE ADMINISTRATION→REAR
S34
DECIDES MIXING ORDER
RETURN

Fig.7

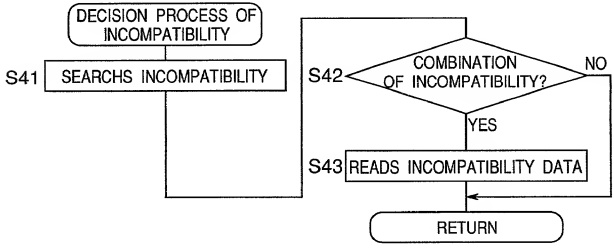

DECISION PROCESS OF INCOMPATIBILITY
S41
SEARCHS INCOMPATIBILITY
S42
COMBINATION OF INCOMPATIBILITY?
NO
YES
S43
READS INCOMPATIBILITY DATA
RETURN

Fig.8

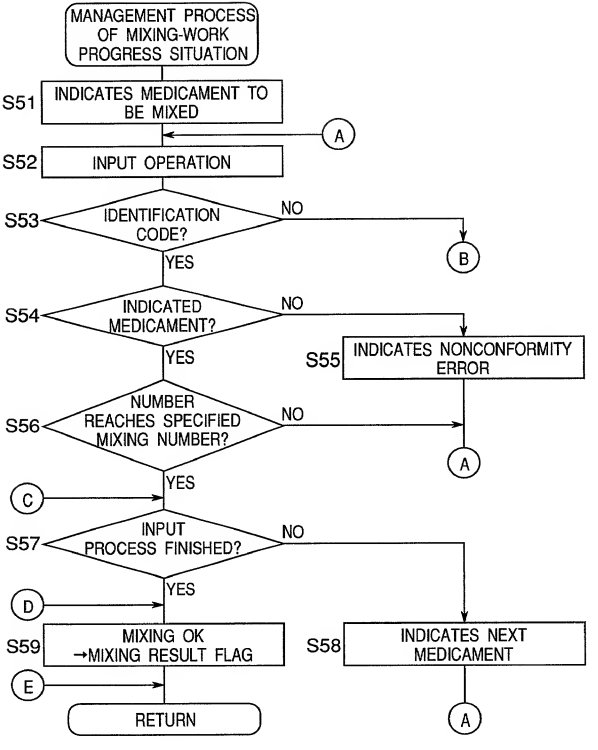

MANAGEMENT PROCESS OF MIXING-WORK PROGRESS SITUATION
S51
INDICATES MEDICAMENT TO BE MIXED
A
S52
INPUT OPERATION
S53
IDENTIFICATION CODE?
NO
B
YES
S54
INDICATED MEDICAMENT?
NO
S55
INDICATES NONCONFORMITY ERROR
YES
S56
NUMBER REACHES SPECIFIED MIXING NUMBER?
NO
A
C
YES
S57
INPUT PROCESS FINISHED?
NO
D
YES
S59
MIXING OK →MIXING RESULT FLAG
S58
INDICATES NEXT MEDICAMENT
E
RETURN
A

Fig.9

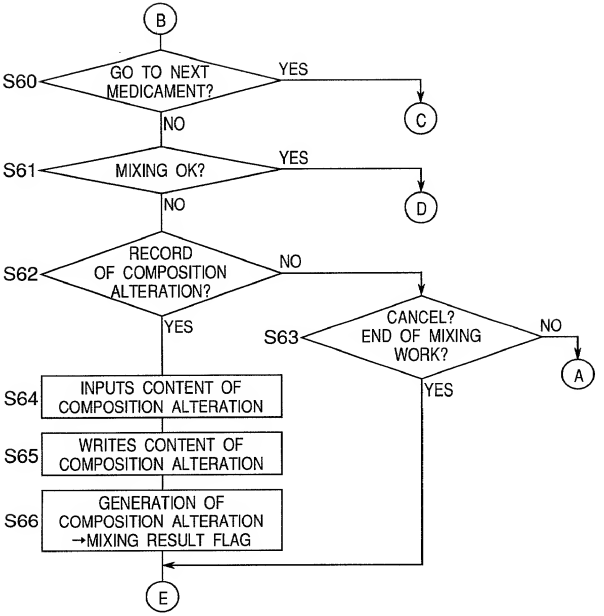
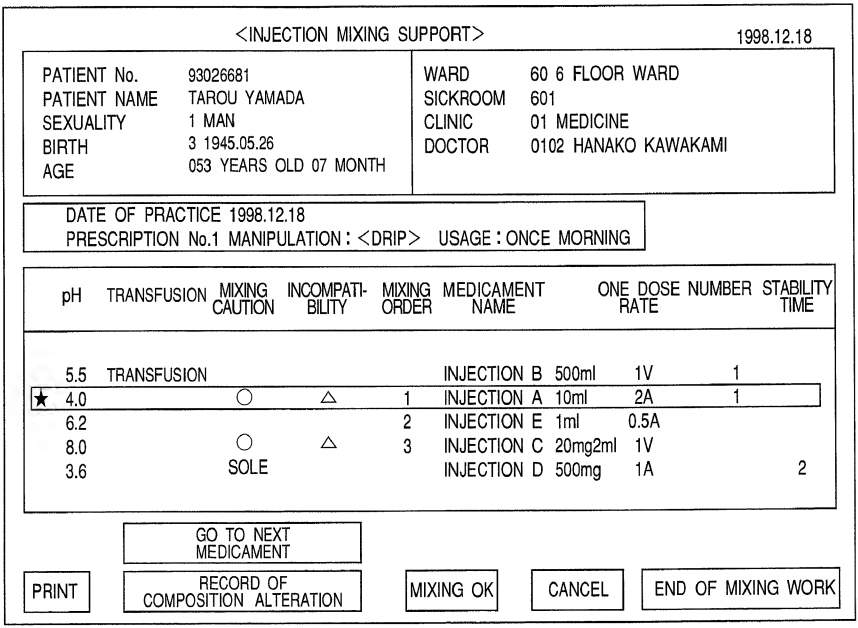

B
S60
GO TO NEXT MEDICAMENT?
YES
C
NO
S61
MIXING OK?
YES
D
NO
S62
RECORD OF COMPOSITION ALTERATION?
NO
S63
CANCEL? END OF MIXING WORK?
NO
A
YES
YES
S64
INPUTS CONTENT OF COMPOSITION ALTERATION
S65
WRITES CONTENT OF COMPOSITION ALTERATION
S66
GENERATION OF COMPOSITION ALTERATION →MIXING RESULT FLAG
E

Fig.10



<INJECTION MIXING SUPPORT> 1998.12.18

PATIENT No.	93026681	WARD	60 6 FLOOR WARD
PATIENT NAME	TAROU YAMADA	SICKROOM	601
SEXUALITY	1 MAN	CLINIC	01 MEDICINE
BIRTH	3 1945.05.26	DOCTOR	0102 HANAKO KAWAKAMI
AGE	053 YEARS OLD 07 MONTH		

DATE OF PRACTICE 1998.12.18
PRESCRIPTION No.1 MANIPULATION : <DRIP> USAGE : ONCE MORNING

	pH	TRANSFUSION	MIXING CAUTION	INCOMPATIBILITY	MIXING ORDER	MEDICAMENT NAME	ONE DOSE	RATE	NUMBER	STABILITY TIME
	5.5	TRANSFUSION				INJECTION B	500ml	1V	1	
★	4.0		○	△	1	INJECTION A	10ml	2A	1	
	6.2				2	INJECTION E	1ml	0.5A		
	8.0		○	△	3	INJECTION C	20mg2ml	1V		
	3.6		SOLE			INJECTION D	500mg	1A		2

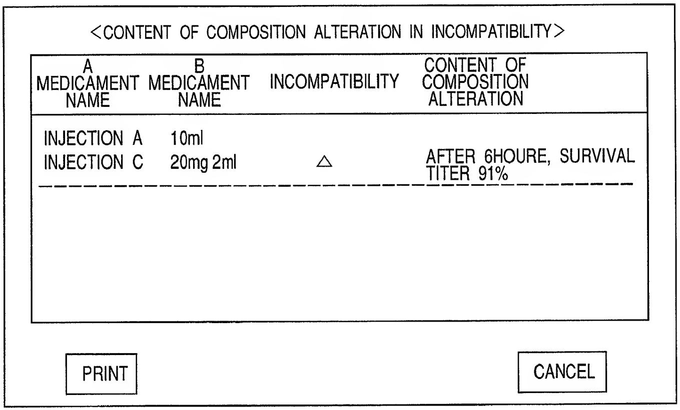
GO TO NEXT MEDICAMENT

PRINT | RECORD OF COMPOSITION ALTERATION | MIXING OK | CANCEL | END OF MIXING WORK

Fig.11

PRESCRIPTION No.	CODE	MEDICAMENT NAME/ MANIPULATION*USAGE	ONE DOSE RATE
1	……		……
	……		……
	……		……
2	INJA	INJECTION A 10ml	2A
	INJB	INJECTION B 500ml	1V
	/02	<DRIP>	
	*103	ONCE, MORNING	

Fig.12



<CONTENT OF COMPOSITION ALTERATION IN INCOMPATIBILITY>
A MEDICAMENT NAME
B MEDICAMENT NAME
INCOMPATIBILITY
CONTENT OF COMPOSITION ALTERATION
INJECTION A
10ml
INJECTION C
20mg 2ml
△
AFTER 6HOURE, SURVIVAL TITER 91%
PRINT
CANCEL

Fig.13

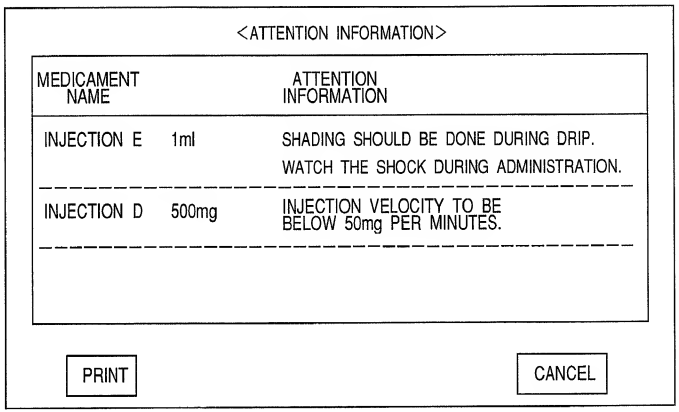
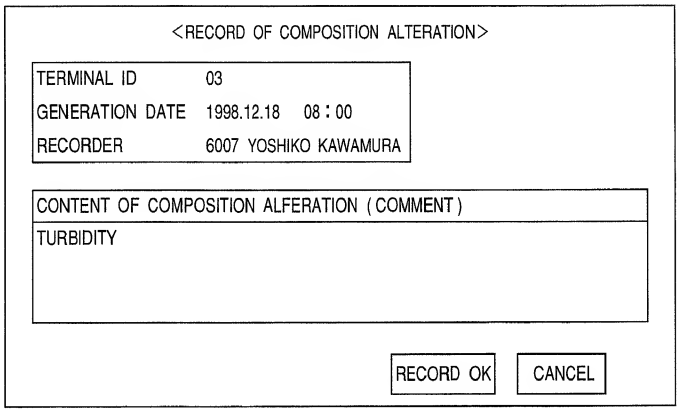

<ATTENTION INFORMATION>
MEDICAMENT NAME
ATTENTION INFORMATION
INJECTION E 1ml
SHADING SHOULD BE DONE DURING DRIP.
WATCH THE SHOCK DURING ADMINISTRATION.
INJECTION D 500mg
INJECTION VELOCITY TO BE BELOW 50mg PER MINUTES.
PRINT
CANCEL

Fig.14


<RECORD OF COMPOSITION ALTERATION>
TERMINAL ID 03
GENERATION DATE 1998.12.18 08 : 00
RECORDER 6007 YOSHIKO KAWAMURA
CONTENT OF COMPOSITION ALFERATION (COMMENT)
TURBIDITY
RECORD OK
CANCEL

DECLARATION AND POWER OF ATTORNEY FOR U.S. PATENT APPLICATION

(X) Original ( ) Supplemental ( ) Substitute ( ) PCT ( ) Design

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Title: APPARATUS FOR SUPPORTING INJECTION MIXING WORK

of which is described and claimed in:

(X) the attached specification, or

( ) the specification in the application Serial No. _____ filed _____;
and with amendments through _____ (if applicable), or

( ) the specification in International Application No. PCT/ _____, filed _____, and as amended on _____ (if applicable).

I hereby state that I have reviewed and understand the content of the above-identified specification, including the claims, as amended by any amendment(s) referred to above.

I acknowledge my duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim priority benefits under Title 35, United States Code, §119 (and §172 if this application is for a Design) of any application(s) for patent or inventor's certificate listed below and have also identified below any application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

COUNTRY	APPLICATION NO.	DATE OF FILING	PRIORITY CLAIMED
Japan	11-119719	April 27, 1999	Yes

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

APPLICATION SERIAL NO.	U.S. FILING DATE	STATUS: PATENTED, PENDING, ABANDONED

And I hereby appoint John T. Miller, Reg. No. 21,120; Michael R. Davis, Reg. No. 25,134; Matthew M. Jacob, Reg. No. 25,154; Jeffrey Nolton, Reg. No. 25,408; Warren M. Cheek, Jr., Reg. No. 33,367; Nils E. Pedersen, Reg. No. 33,145 and Charles R. Watts, Reg. No. 33,142, who together constitute the firm of WENDEROTH, LIND & PONACK, L.L.P., attorneys to prosecute this application and to transact all business in the U.S. Patent and Trademark Office connected therewith.

I hereby authorize the U.S. attorneys named herein to accept and follow instructions from AOYAMA & PARTNERS as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and myself. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by me.

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Full Name of First Inventor	FAMILY NAME YUYAMA	FIRST GIVEN NAME Hiroyuki	SECOND GIVEN NAME
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Post Office Address	ADDRESS c/o YUYAMA MFG. CO., LTD., 3-1, Meishinguchi 3-chome, Toyonaka-shi, Osaka-fu, Japan	CITY	STATE OR COUNTRY / ZIP CODE 561-0841
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Residence & Citizenship	CITY Toyonaka-shi	STATE OR COUNTRY Japan	COUNTRY OF CITIZENSHIP Japan
Post Office Address	ADDRESS c/o YUYAMA MFG. CO., LTD., 3-1, Meishinguchi 3-chome, Toyonaka-shi, Osaka-fu, Japan	CITY	STATE OR COUNTRY / ZIP CODE 561-0841
Full Name of Third Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY / ZIP CODE
Full Name of Fourth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY / ZIP CODE

Full Name of Fifth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE
Full Name of Sixth Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE
Full Name of Seventh Inventor	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME	
Residence & Citizenship	CITY	STATE OR COUNTRY	COUNTRY OF CITIZENSHIP	
Post Office Address	ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

I further declare that all statements made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

1st Inventor Hiroyuki Nyuzama Date April 14, 2000

2nd Inventor Keita Yasuoka Date April 14, 2000

3rd Inventor _____ Date _____

4th Inventor _____ Date _____

5th Inventor _____ Date _____

6th Inventor _____ Date _____

7th Inventor _____ Date _____

The above application may be more particularly identified as follows:

U.S. Application Serial No. _____ Filing Date _____

Applicant Reference Number _____ Atty Docket No. _____

Title of Invention APPARATUS FOR SUPPORTING INJECTION MIXING WORK